REMARKS

35 U.S.C. § 103

1. The Examiner rejected claims 1-5, 8-10, 13-18, 21-33, 36-42, and 45-49 under 35 U.S.C. § 103(a) as being unpatentable over Thorsteinson et al. (US Patent No. 5,187,140, "Thorsteinson", hereinafter).

The present invention provides a solution to the problem of improving the catalytic properties of certain supported catalysts, in particular silver-containing catalysts with specific promoters (phosphorus, boron, fluorine, lithium, sodium, rubidium, Group IIA through Group VIII metals, and rare earth metals, as defined in claim 1). An improved catalyst performance (activity and/or selectivity in olefin epoxidation) was found by selecting a carrier having a sodium solubilization rate no greater than 5 ppmw/5 minutes, and depositing the specific catalytically active components onto the carrier (cf. the present application at page 2, line 29 – page 3, line 2). Evidence for the advantages can be found in the working examples, cf. in particular Table II on page 19 and the explanation provided at page 20 of the present patent application.

The Examiner stated "the reference discloses that cesium sulfate exemplified in combination with carrier AJ to be functionally equivalent to the promoters and combinations required by the instant claims. It would be obvious to one having ordinary skill in the art at the time the invention was made to have substituted the ce[s]ium sulfate supported on carrier AJ with any other, functionally equivalent promoters taught by the reference, with a reasonable expectation of success" (cf. Office Action, page 4, first full paragraph).

According the Manual of Patent Examining Procedure, 8th Edition, Incorporating Revision No. 2 ("MPEP", hereinafter), paragraph 2141, "Office policy is to follow *Graham v. John Deere Co.* in the consideration and determination of obviousness under 35 U.S.C. 103. [...] [T]he four factual enquires enunciated therein as a background for determining obviousness are as follows:

(A) [...]

(B) Ascertaining the differences between the prior art and the clams at issue;

(C) [...]; and

(D) [...]."

According to MPEP, paragraph 2141.02, "[a]scertaining the differences between the prior art and the claims at issue requires [...] considering both the invention and the prior art references as a whole". Also, "[o]bviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a certain feature is later established. *In re Rijckaert*, 9 F.2d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993)".

It is respectfully submitted that, on the one hand, the Examiners' statement is not based on a consideration of both the invention and the reference as a whole, and, on the other hand, it is in part based on what is not known at the time the invention was made. These submissions will be clarified in the following paragraphs.

As set out hereinbefore, the invention as claimed is based on the finding that an improved catalyst performance can be achieved by selecting a carrier which has a sodium solubilization rate of no greater than 5 ppmw/5 minutes and depositing the specific catalytically active components onto the carrier as specified in the claims. The Examiner has not considered the invention as a whole, in that he did not consider the feature of selecting a carrier which has a sodium solubilization rate of no greater than 5 ppmw/5 minutes. The Examiner did also not consider the technical effects (advantages) of selecting such a carrier vis-à-vis selecting a carrier which does not meet the required sodium solubilization rate.

When considering Thorsteinson, i.e. the reference, as a whole, it becomes apparent that Thorsteinson does not give the skilled person any motivation to select the washed carrier AJ from the large number of carriers which have been disclosed by Thorsteinson. Namely, if the impregnation solution is used and reused there is a choice of either removing such ions, or taking them into account during the catalyst preparation (cf. Thorsteinson, column 15, lines 20-30). Removing the ions would point to the use of washed carrier; taking them into account during the catalyst preparation would point to the use of unwashed carrier. If the impregnation solution is not reused, there is no apparent motivation to select a washed carrier. Also, there is no motivation to use the washed carrier AJ because its preparation requires elaborate washing and drying, as disclosed in column 46, lines 7-11, which other carriers do not require. Further, nowhere in Thorsteinson there is a statement suggesting that selecting the washed carrier AJ from the large number of carriers disclosed would lead to an improved catalyst performance.

The Examiner denied non-obviousness of the invention as claimed by stating that "it would have been obvious [...] at the time the invention was made to have substituted the ce[s]ium sulfate supported on carrier AJ with any other, functionally equivalent promoters taught by the reference, with a reasonable expectation of success" (page 7, first paragraph). The Examiner presupposed that carrier AJ has a sodium solubilization rate of no greater than 5 ppmw/5 minutes. As acknowledged by the Examiner, Thorsteinson does not disclose that the carrier AJ has a sodium solubilization rate of no greater than 5 ppmw/5 minutes. As stated in MPEP, see hereinbefore, "[o]bviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a feature is later established."

Thorsteinson teaches silver epoxidation catalysts having an enhanced activity and/or stability. There are provided silver epoxidation catalysts in which advantages of high silver content can be realized by combining a high silver content with a high surface area, high porosity carrier (column 6, lines 24-33). Thorsteinson is completely silent on the sodium solubilization rate of the carriers disclosed. Thorsteinson does not suggest or teach that an improved catalyst performance can be achieved by selecting a carrier which has a sodium solubilization rate of no greater than 5 ppmw/5 minutes and depositing the specific catalytically active components onto the carrier. Even, there is no statement in Thorsteinson suggesting that an improved catalyst performance can be achieved by selecting carrier AJ (which the Examiner presupposed to meet the sodium solubilization rate requirement) and depositing specific the catalytically active components onto carrier AJ.

Thus, the Examiners' rejection on the basis of obviousness is, on the one hand, not based on a consideration of both the invention and the reference as a whole, and, on the other hand, it is in part based on what is not known at the time the invention was made. Further, it not only appears that the Examiner's rejections of the claims on the basis of obviousness over Thorsteinson are not well based, there are clear indications that the claims are unobvious and patentable over Thorsteinson.

In the Examiner's Response to Arguments, the Examiner maintains that the property relied upon by applicant (i.e. a sodium solubilization rate of no greater than 5 ppmw/5 minutes) is in fact an inherent characteristic of carrier AJ: "The reference details a specific washing sequence that lowers the amount of leachable sodium in carrier AJ. The Examiner notes that sodium is removed by a similar washing

procedure in the instant specification. Therefore, the Examiner would submit that there is a reasonable basis for the assertion that the claimed property would in fact be inherent. The burden shifts to applicant that this characteristic would not be inherent." (cf. Office Action, page 9, first full paragraph) It is respectfully observed that because the instant specification was not known subject matter at the time the invention was made, the instant specification can not provide a reasonable basis for the assertion that the claimed property would in fact be inherent in Thorsteinson's carrier AJ. As stated in MPEP, see hereinbefore, "[o]bviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a feature is later established." Accordingly, the Examiner's further statement that "[t]he burden shifts to applicant that this characteristic would not be inherent", is not well based.

Applicant respectfully requests that the Examiner reconsider the present rejections in the light of the arguments presented in these remarks.

2. The Examiner rejected claims 6-7, 19-20, 34-35, and 43-44 under 35 U.S.C. § 103(a) as being unpatentable over Thorsteinson, as applied to claims 1-5, 8-10, 13-18, 21-33, 36-42, and 45-49, in further view of Matusz (U.S. Patent No. 5,739,075).

Applicant's considerations relating to Thorsteinson, as presented above, are also relied upon in traversing the present rejections.

Matusz teaches the preparation of improved supported silver catalysts for the epoxidation of olefins, by pre-doping, pre-treating or pre-impregnating the carrier with a salt of a rare earth metal and a salt of an alkaline earth metal and/or a Group VIII transition metal. Any of a large number of carriers or support materials may be used, for example alpha-alumina (cf. Matusz, col. 2, lines 12-36; col. 4, lines 10-32; col. 15, lines 42-45).

Each of the presently rejected claims involves "sodium solubilization rates." Matusz, like Thorsteinson (as discussed above), is silent with respect to sodium solubilization rates and any effect which they have on the performance of a catalyst in an epoxidation process. It follows that any combination of Thorsteinson and Matusz could not teach or suggest the sodium solubilization rates involved in claims 6-7, 19-20, 34-35, and 43-44. Modifying the invention of Thorsteinson by including additional promoters taught by Matusz does not provide the invention as presently claimed. Therefore, the claims are unobvious and patentable over Thorsteinson in further view of Matusz.

Applicant respectfully requests that the Examiner reconsider the present rejections in the light of the arguments presented in these remarks.

3. The Examiner rejected claims 1-6, 9-19, 22-34, 37-43, and 46-49 under 35 U.S.C. § 103(a) as being unpatentable over Finch et al. (U.S. Patent No. 2,424,083, "Finch" hereinafter) in view of Notermann et al. (U.S. Patent No. 4,994,587, "Notermann" hereinafter).

Each of these claims involves "a carrier having a sodium solubilization rate no greater than 5 ppmw/5 minutes." In rejecting these claims, the Examiner asserted in the Office Action (cf. page 5-6) that:

> Finch et al. does not disclose that the support is treated such that the sodium solubilization rate is no greater than 5 ppmw per 5 minutes.
> Notermann et al. (US 4,994,587) discloses a catalytic system for epoxidation of alkenes. The catalyst comprises silver on a solid support (column 11, lines 55-60). The support has less than about 50 and most frequently less than about 20 ppm of leachable sodium (column 11, lines 60-63). A preferred support material is alpha alumina (column 13, lines 1-2).
> Notermann et al. teaches that improved results are obtained by using a support wherein the support contains low levels of leachable sodium (column 13, lines 28-35). Notermann et al. teaches that the presence of leachable sodium exhibits deactivating and effective life-shortening effects on the catalytic system (column 11, lines 18-25). The low sodium support can be prepared by any methods suitable for removing sodium from a solid (column 13, lines 40-45). Typically the techniques involve extraction and/or volatilization of the sodium present (column 13, lines 50-68). Prepared supports have BET surface areas of 1.56 m^2/g (column 23, Example 1).
> Notermann et al. does not specifically disclose that the sodium solubilization rate of the carrier is no greater than 5 ppmw/5 minutes. However, it is considered that because Notermann et al. teaches removing leachable sodium from the carrier material, the resulting material will have the solubilization rate instantly claimed.

The Examiner's rejection is based upon an assertion by the Examiner that Notermann inherently discloses "a carrier having a sodium solubilization rate no greater than 5 ppmw/5 minutes." However, to satisfy the Examiner's burden of proof, "the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990); *see also In re Robertson*, 169 F.3d 743, 745, 49 U.S.P.Q.2d 1949, 1950-51 (Fed. Cir. 1999). Further, as discussed hereinbefore, it follows from the MPEP that "[o]bviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a feature is later established."

The Examiner's reasoning, quoted above in the block quote, does not reasonably support a determination that "a carrier having a sodium solubilization rate no greater than 5 ppmw/5 minutes" necessarily flows from the teachings of Notermann. Without more, a teaching of sodium removal and levels of leachable sodium, which the Examiner asserts are present in Notermann, provide insufficient basis for any determinations or estimations concerning whether a sodium solubilization rate is no greater than 5 ppmw/5 minutes. At best, the Examiner has proposed a mere possibility. For example, while the carrier as treated in Example 1 of Notermann by heating with NH_4F may have a relatively low sodium content, the carrier could possibly still have a relatively high sodium solubilization rate when contacted with water. Thus the Examiner has not satisfied the burden of proof required to maintain this rejection based on a theory of inherent disclosure, in particular that the inherency was established before the invention was made. In addition, nowhere does Notermann teach or suggest selecting a carrier having a sodium solubilization rate no greater than 5 ppmw/5 minutes and subsequently using the carrier for making a catalyst comprising silver and promoters selected from phosphorus, boron, fluorine, lithium, sodium, rubidium, Group IIA through Group VIII metals, rare earth metals, and combinations thereof.

As acknowledged by the Examiner, "Finch et al. does not disclose that the support is treated such that the sodium solubilization rate is no greater than 5 ppmw per minutes" and "Notermann et al. does not specifically disclose that the sodium solubilization rate of the carrier is no greater than 5 ppmw/5 minutes." Because each of the presently rejected claims involves "a carrier having a sodium solubilization rate no greater than 5 ppmw/5 minutes," any combination of Finch with Notermann could not teach or suggest claims 1-6, 9-19, 22-34, 37-43, and 46-49. As indicated hereinbefore, "[o]bviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a feature is later established."

In the Office action the Examiner submitted that "[i]t would have been obvious [...] to substitute the carrier taught by Finch with the carrier taught by Notermann [...] in the light of the suggestion of Notermann that the use of low sodium alumina carrier will obtain a catalyst with improved properties and avoid deleterious effect of leachable sodium. Since both catalysts can be used to convert ethylene to ethylene oxide, one would have reasonable expectation of success from the combination." (cf. page 7, first

full paragraph). However, it is respectfully submitted that the Examiner has based the rejections on a selective consideration of only portions of Notermann. According to the MPEP, paragraph 2141.03, "[a] prior art reference must be considered in its entirety, i.e. as a whole, including portions that would lead away from the claimed invention" (emphasis added).

Applicant respectfully submits that the Examiner's citation of Notermann's column 13, lines 28-35 has to be read in conjunction with Notermann's passages in column 11, lines 19-47 and column 12, lines 8-10, which teach that different instances lead to different effects of leachable sodium, namely: "The presence of leachable sodium [...] tends, in some instances, to improve the efficiency of the system under epoxidation conditions generally used. In the presence of CO_2 and certain efficiency enhancing compounds, however, sodium exhibits deactivating and effective life-shortening effects on epoxidation catalysts and systems. [...] The catalyst and process of [Notermann's] invention diminish the deactivating and life-shortening effects of CO_2 [when present in combination with sodium sodium]" and "can be used with recylcled effluent streams containing carbon dioxide" (emphasis added).

Thus, on the one hand, Notermann contains the general teaching that the presence of leachable sodium improves the efficiency under epoxidation conditions generally used, and, on the other hand, Notermann contains the specific teaching only applicable to cases of deactivating and life-shortening effects of having the combination sodium in the catalyst and CO_2 in the feedstream, in which it is advantageous to use Notermann's invention, i.e. to use a carrier with a low content of leachable sodium.

Finch teaches "catalyst compositions having a high initial activity in a wide variety of chemical reactions, and capable of retaining their high activity over long periods of use" (column 1, lines 47-54). More specifically, Finch teaches that "[t]he activity of the catalysts may, in many instances, be further materially increased or promoted by the addition of small amounts of a sodium compound" (cf. column 4, lines 44-47). Finch is completely silent about CO_2, as such, let alone any deactivating and life-shortening effects associated with having CO_2.

Applicant respectfully submits that if the skilled person would have a reason to consult Notermann in relation to Finch's disclosures, in the absence of any reference in Finch to (effects of) CO_2, he would have motivation only to follow Notermann's general teaching that the presence of leachable sodium tends to improve the efficiency of the

system". It is emphasized that this general teaching is consistent with the teaching by Finch that the activity of the catalysts may, in many instances, be further materially increased or promoted by the addition of small amounts of a sodium compound" (column 4, lines 44-47). Thus, the skilled person is discouraged from applying a carrier with a low content of leachable sodium, let alone a carrier with a low sodium solubilization rate, e.g. no greater than 5 ppmw/5 minutes. This clearly leads away from the present invention.

In the absence of any reference in Finch to (effects of) CO_2, the skilled person would not find any motivation to apply Notermann's specific teaching which aims at diminishing deactivating and life-shortening effects of associated with CO_2 by using a carrier with a low content of leachable sodium. Preparing such carriers would also require elaborate procedures such as set out in Notermann's column 13, line 41 - column 14, line 65. As an addition, even if the skilled person would find motivation to apply a carrier with a low content of leachable sodium, then still he would not necessarily arrive at using a carrier with a low sodium solubilization rate, e.g. no greater than 5 ppmw/5 minutes.

In view of the above, it is respectfully submitted that the rejections, based on Finch and Notermann, are not based on a proper consideration of Notermann, and that a proper consideration of Notermann in its entirety leads to the conclusion that Notermann leads away from the present invention. Thus, claims 1-6, 9-19, 22-34, 37-43, and 46-49 are unobvious and patentable over Finch in view of Notermann. The non-obviousness of the present claims over Finch and Notermann can be stated independent of whether or not Notermann's carrier inherently meets the solubilization rate instantly claimed.

In view of Examiner's comments in the paragraphs on pages 11 and 12 of the Office Action, Applicant wishes to make the following observations.

Notermann, column 11, lines 18-47, teaches that "[i]n many commercially used epoxidation reactors [...] the effluent stream always contains some carbon dioxide. In a reactor in which the effluent stream is recycled to the reactor, therefore, the feedstream always contains some carbon dioxide." Notermann goes on to explain that "[c]ommonly, the carbon dioxide is removed by a scrubbing device [...] placed in the effluent stream between the effluent outlet and the reactor outlet." Therefore, the distinction made by Notermann is between, on the one hand, processes in which the

feedstream contains CO_2 and, on the other hand, processes in which the feedstream does not contain (significant quantities of) CO_2 (in the latter case, either there is no recycle of effluent, or CO_2 has been removed from the effluent stream prior to recycling to the feedstream). Notermann can make and did make this distinction, despite the fact that at least some CO_2 is produced in any epoxidation process (cf. also Notermann, column 1, lines 30-41). It is then clear from Notermann's passage in column 11 that the wording "in the presence of CO_2" (cf. column 11, line 21) should be read as meaning that the feedstream contains CO_2 (compare the sentence of column 11, lines 21-24, with the sentence of column 11, lines 35-40), rather than that the wording refers to CO_2 which is inevitably formed in the process.

Nevertheless, the Examiner has taken the position that -because "the catalysts will always be used in the presence of carbon dioxide"- "it would have been obvious to one having ordinary skill to combine the teachings of the references [i.e. Notermann and Finch] to overcome the problems of the prior art [...] to arrive at the claimed invention". It is respectfully submitted that one having ordinary skill would not combine the teachings of Notermann and Finch because the teachings are conflicting where they relate to the presence of sodium in the catalysts.

On the one hand, Finch teaches catalyst compositions having high initial activity and retaining their activity over long periods of use (column 1, lines 47-54), and also teaches that sodium compounds may be used in the preparation of the silver solution to be used in the preparation of the catalyst (column 2, line 41 – column 3, line 14), sodium compounds may be used as promoters (column 4, lines 57), and even the catalyst support may be pretreated with sodium hydroxide (column 5, lines 23-25). Finch's teachings have been illustrated in working examples relating to the catalysts and a process for making ethylene oxide from ethylene; cf. also the commentary to Finch's working examples in column 6, lines 28-35.

On the other hand, Notermann teaches that the carrier has a low content of leachable sodium (column 11, line 50 – column 12, line 6). However, Notermann's teaching is clearly limited to carriers for catalysts which are used in processes having CO_2 in the feedstream.

As it is clear from the reading of Thorsteinson (column 15, lines 9-42), leachable ions present in the carrier tend to penetrate into the impregnation solution which contains silver and other catalyst ingredients, and may then become indistinguishable

from such ions specifically added to the impregnation solution, for example, as promoter.

According to the MPEP, paragraph 2143.01, "where the teachings of two or more prior art references conflict, the examiner must weigh the power of each reference to suggest solutions to one of ordinary skill in the art, considering the degree to which one reference might accurately discredit another. *In re Young*, 927 F.2d 588, 18 USPQ2d 1089 (Fed. Cir. 1991)." It is respectfully submitted that the Examiner has not weighed the power of each reference, as provided by the MPEP, and for this further reason the rejections are not properly based.

These observations support the earlier conclusion that claims 1-6, 9-19, 22-34, 37-43, and 46-49 are unobvious and patentable over Finch in view of Notermann.

Applicant respectfully requests that the Examiner reconsider the present rejections in the light of the arguments presented in these remarks.

4. The Examiner rejected claims 7-8, 20-21, 35-36, and 44-45 under 35 U.S.C. § 103(a) as being unpatentable over Finch et al. in view of Notermann et al. as applied to claims 1-6, 9-19, 22-34, 37-43, and 46-49, discussed above, and further in view of Matusz. In making the present rejection, the Examiner relied upon the modified disclosure of Finch et al., discussed above, as applied to claims 1-6, 9-19, 22-34, 37-43, and 46-49 to support the present rejection.

As shown above, the Examiner has not met the burden of proof necessary to support a theory of inherent disclosure by Notermann. Further, as shown above, Notermann and Finch cannot be properly combined in the manner proposed by the Examiner in the rejection of claims 1-6, 9-19, 22-34, 37-43, and 46-49 over these references. Thus reliance upon Finch in view of Notermann, as applied above by the Examiner to claims 1-6, 9-19, 22-34, 37-43, and 46-49, cannot properly support the rejections under 35 U.S.C. § 103 of claims 7-8, 20-21, 35-36, and 44-45.

As discussed previously, Finch, Notermann, and Matusz are all silent with respect to sodium solubilization rates. Because each of the presently rejected claims involves "a carrier having a sodium solubilization rate no greater than 5 ppmw/5 minutes," any combination of these cited references could not teach or suggest the subject matter of claims 7-8, 20-21, 35-36, and 44-45. Therefore, these claims are unobvious and patentable over the cited art.

Applicant respectfully requests that the Examiner reconsider the present rejections in the light of the arguments presented in these remarks.

Each of the rejections having been traversed, allowance of the claims of the present application is respectfully requested. If the Examiner would like to discuss this case with Applicant's attorney, the Examiner is invited to contact Richard Lemuth at the phone number below.

Respectfully submitted,

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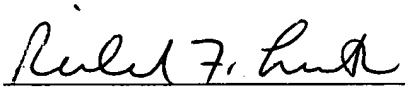
By: 

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